Claims

1. A method for operating a computational device as a support vector machine in order to define a decision surface separating two opposing classes of a training set of vectors, the method including the steps of:

associating a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class; and

determining a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimised.

2. A method according to claim 1, wherein the distance parameter comprises the average of the distances from the vector that the distance parameter is associated with to each of the vectors in the opposite class.

3. A method according to claim 1, wherein the distance parameter comprises the shortest of the distances from the vector that the distance parameter is associated with to each of the vectors in the opposite class.

4. A method according to claim 1, wherein the distance parameter is calculated according to the equation $|\mathbf{v} - \mathbf{u}|^2 = K(\mathbf{u}, \mathbf{u}) + K(\mathbf{v}, \mathbf{v}) - 2K(\mathbf{v}, \mathbf{u})$ where $\mathbf{v}$ and $\mathbf{u}$ are vectors and K is a kernel function used to define the decision surface.

5. A method according to claim 1, wherein the step of determining a linearly independent set of support vectors is performed by rank revealing QR reduction.

6. A method according to claim 1, wherein the step of determining a linearly independent set of support vectors is performed by apply a reduced row echelon form method with pivoting on the vector having the smallest associated distance parameter.

7. A computer software product including a computer readable medium for execution by one or more processors of a computer system, the software product including:

instructions to define a decision surface separating two opposing classes of a training set of vectors;

instructions to associate a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class; and

instructions to determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimised.

8 A computer software product according to claim 7, including instructions to calculate the distance parameter as the average of the distances from the vector that the distance parameter is associated with to each of the vectors in the opposite class.

9. A computer software product according to claim 7, including instructions to calculate the distance parameter as the shortest of the distances from the vector that the distance parameter is associated with to each of the vectors in the opposite class.

10. A computer software product according to claim 7, including instructions to calculate the distance parameter according to the equation $|\mathbf{v} - \mathbf{u}|^2 = K(\mathbf{u}, \mathbf{u}) + K(\mathbf{v}, \mathbf{v}) - 2K(\mathbf{v}, \mathbf{u})$ where $\mathbf{v}$ and $\mathbf{u}$ are vectors and K is a kernel function used to define the decision surface.

11. A computer software product according to claim 7, including instructions to apply rank revealing QR reduction to the support vectors in order to determine the linearly independent set of support vectors.

12. A computer software product according to claim 7, including instructions to determine the linearly independent set of support vectors by transforming a matrix of

the support vectors to reduced row echelon form by pivoting on the vector having the smallest associated distance parameter.

13. A computational device configured to define a decision surface separating two opposing classes of a training set of vectors, the computational device including one or more processors arranged to:

associate a distance parameter with each vector of the training set, the distance parameter indicating a distance from its associated vector to the opposite class; and

determine a linearly independent set of support vectors from the training set such that the sum of the distances associated with the linearly independent support vectors is minimised.

14. A computational device according to claim 13, wherein the one or more processors are arranged to determine the distance parameter as the average of the distances from the vector that the distance parameter is associated with to each of the vectors in the opposite class.

15. A computational device according to claim 13, wherein the one or more processors are arranged to determine the distance parameter as the shortest of the distances from the vector that the distance parameter is associated with to each of the vectors in the opposite class.

16. A computational device according to claim 13, wherein the one or more processors are arranged to determine the distance parameter according to the equation $|\mathbf{v} - \mathbf{u}|^2 = K(\mathbf{u}, \mathbf{u}) + K(\mathbf{v}, \mathbf{v}) - 2K(\mathbf{v}, \mathbf{u})$ where $\mathbf{v}$ and $\mathbf{u}$ are vectors and K is a kernel function used to define the decision surface.

17. A computational device according to claim 13, wherein the one or more processors are arranged to apply rank revealing QR reduction to the support vectors in order to determine the linearly independent set of support vectors.

18. A computational device according to claim 13, wherein the one or more processors are arranged to determine the linearly independent set of support vectors by transforming a matrix of the support vectors to reduced row echelon form with pivoting on the vector having the smallest associated distance parameter.